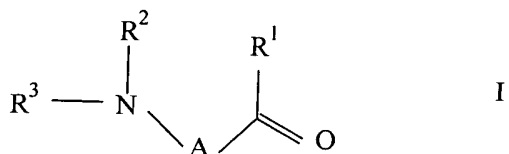


Claims:

1. An insecticide of formula 1



- and the agriculturally acceptable salts thereof,
 5 wherein:

R¹ is selected from the group consisting of:

- the group OR⁵ wherein R⁵ is selected from the group consisting of hydrogen,
 10 alkyl, substituted alkyl, aryl, substituted aryl, cycloalkyl, substituted cycloalkyl,
 heterocyclic and substituted heterocyclic;

- the group -NR₆OH wherein R⁶ is selected from the group consisting of
 hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, carbocyclic and
 15 substituted carbocyclic;

- the group NR⁷R⁸ wherein R⁷ and R⁸ are independently selected from the
 group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl and
 carbocyclic; and

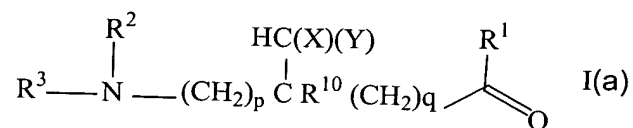
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the group wherein R¹ is linked to R² to form a diradical bridging group;

- R² and R³ are independently selected from the group consisting of hydrogen,
 alkyl, substituted alkyl, carbocyclic, substituted carbocyclic, aryl, substituted
 25 aryl, acyl and substituted acyl; and

A is a diradical linking group which has a molecular weight of preferably less
 than 200 and more preferably less than 100.

2. An insecticide comprising the compound of formula I



- 5 R¹ is selected from the group consisting of:
- the group OR⁵ wherein R⁵ is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, cycloalkyl, substituted cycloalkyl, heterocyclic and substituted heterocyclic;
- 10 the group -NR⁶OH wherein R⁶ is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, carbocyclic and substituted carbocyclic;
- the group NR⁷R⁸ wherein R⁷ and R⁸ are independently selected from the
- 15 group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl and carbocyclic; and
- the group wherein R¹ is linked to R² to form a diradical bridging group;
- 20 R² and R³ are independently selected from the group consisting of hydrogen, alkyl, substituted alkyl, carbocyclic, substituted carbocyclic, aryl, substituted aryl, acyl and substituted acyl; and
- R¹⁰, X and Y are independently selected from the group consisting of
- 25 hydrogen, alkyl, thiol, hydroxy, thioalkyl, alkoxy, substituted alkyl, carbocyclic, substituted carbocyclic, heterocyclic and substituted heterocyclic;
- P and q are selected from 0, 1, 2 and 3; and
- 30 the agriculturally acceptable salts of compounds of formula I.

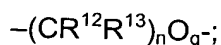
3. A compound according to claim 2 wherein
R¹ is selected from the group consisting of:

5 the group OR⁵ wherein R⁵ is selected from the group consisting of hydrogen, alkyl, haloalkyl, aryl substituted alkyl, heterocyclic, heterocyclic substituted with alkyl wherein the alkyl is optionally further substituted with hydrocarbyloxy;

10 the group -NR₆OH wherein R⁶ is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, carbocyclic and substituted carbocyclic;

the group NR⁷R⁸ wherein R⁷ and R⁸ are independently selected from hydrogen and C₁ to C₆ alkyl; and

15 the group wherein R¹ is linked to R² to form a bridging group -R²-R¹- of formula

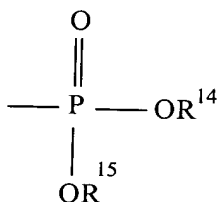


wherein n is 1 or 2, q is zero or 1 and R¹² and R¹³ are independently selected from hydrogen, halogen, alkyl and haloalkyl;

20

R² is selected from the group consisting of hydrogen, alkyl, haloalkyl, aryl, alkylaryl and aralkyl;

25 the group substituted alkyl, substituted haloalkyl, substituted acyl, substituted aryl, substituted alkylaryl and substituted arylalkyl, wherein the substituent is a group of formula



wherein R¹⁴ and R¹⁵ are independently selected from the group consisting of hydrogen, halo, alkyl, aryl, alkanoyl, alkylaryl, aralkyl, haloalkyl, haloaryl, haloalkyl aryl and haloarylalkyl;

30

the group wherein R^2 is linked to R^1 to provide the group $-R^2-R^1-$ of formula
 $-(CR^{12}R^{13})_nO_p-$

wherein n is 1 or 2, p is 0 or 1 and R^{12} and R^{13} are independently selected
 5 from hydrogen, alkyl and haloalkyl;

p and q are independently selected from 0 and 1; and

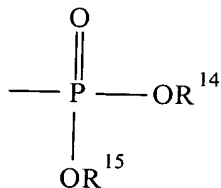
R^{10} is hydrogen; and X and Y are independently selected from the group
 10 consisting of hydrogen, C_1 to C_6 alkyl, thiol, hydroxy, C_1 to C_6 thioalkyl, C_1 to
 C_6 alkoxy, substituted C_1 to C_6 alkyl, C_4 to C_6 carboxylic substituted C_4 to C_6
 heterocyclic and substituted C_4 to C_6 heterocyclic.

4 An insecticide according to claim 2 wherein
 15 R^1 is selected from the group consisting of hydroxy, C_1 to C_6 alkyl,
 halogenated C_1 to C_4 alkyl;

the group NR_6OH wherein R^6 is selected from the group consisting of
 hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, carbocyclic and
 20 substituted carbocyclic; and

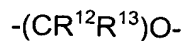
the group NR^7R^8 wherein R^7 and R^8 are independently selected from hydrogen
 and C_1 to C_4 alkyl;

25 R^2 is selected from the group consisting of hydrogen C_1 to C_8 alkyl, halo $-(C_1$
 to $C_6)$ alkyl and C_1 to C_6 alkyl substituted by the group of formula



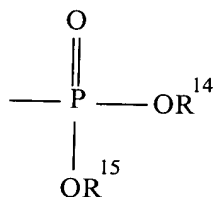
wherein R^{14} and R^{15} are independently selected from the group consisting of
 hydrogen and C_1 to C_4 alkyl; and

and the group wherein R^2 is linked to R^1 to provide the group $-R^1-R^2-$ of formula



where R^{12} and R^{13} are independently selected from hydrogen, C_1 to C_4 alkyl
5 and C_1 to C_4 haloalkyl;

R^3 is selected from the group consisting of hydrogen, C_1 to C_6 alkyl, C_1 to C_6 alkanoyl, C_1 to C_6 haloalkyl and C_1 to C_6 alkyl and C_1 to C_6 alkyl substituted by the group of formula



10

wherein R^{14} and R^{15} are independently selected from the group consisting of hydrogen and C_1 to C_4 alkyl;

p and q are zero;

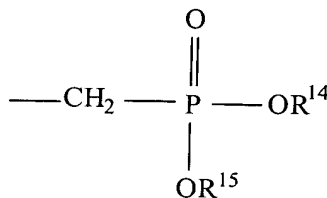
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R^{10} is hydrogen and

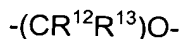
X and Y are independently selected from the group consisting of hydrogen, C_1 to C_4 alkyl thiol, aryl, hydroxyaryl, acyl, aryl substituted C_1 to C_4 alkyl,
20 heterocyclic, thio- C_1 to C_4 alkyl, amino- C_1 to C_4 alkyl and hydroxyalkyl.

5. An insecticide according to claim 2 wherein

R^2 is selected from the group consisting of hydrogen; and C_1 to C_4 alkyl; the
25 group of formula

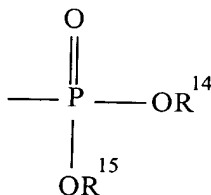


wherein R^{14} and R^{15} are independently selected from the group consisting of hydrogen and C_1 to C_4 alkyl; and the group wherein R^2 is linked to R^1 to provide the group $-R^2-R^1-$ of formula



- 5 wherein R^{12} and R^{13} are selected from methyl and trifluoromethyl;

R^3 is selected from the group consisting of hydrogen, C_1 to C_6 alkyl, C_1 to C_6 alkanoyl, C_1 to C_6 haloalkyl and C_1 to C_6 alkyl and C_1 to C_6 alkyl substituted by the group of formula

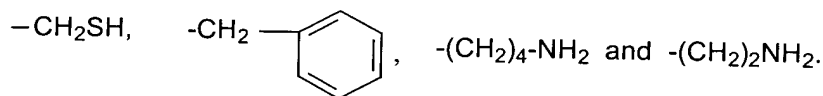
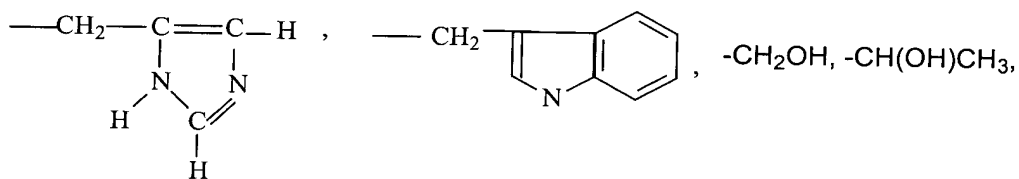


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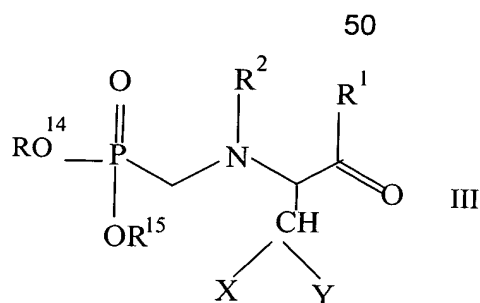
wherein R^{14} and R^{15} are independently selected from the group consisting of hydrogen and C_1 to C_4 alkyl.

6. An insecticide according to claim 2 wherein the group $HC(X)(Y)$ is selected from the group consisting of: $-\text{CH}_3$, $-\text{CH}(\text{CH}_3)_2$, $-\text{CH}_2\text{CH}_2\text{SCH}_3$, $-\text{CH}_2\text{CH}(\text{CH}_3)_2$, $-\text{CH}_2\text{CH}_2\text{CH}_2\text{NHCNHNH}_2$, $-\text{CH}_2\text{C}_6\text{H}_5\text{OH}$, $-\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$,

15



7. An insecticide comprising the compound of formula III



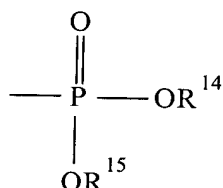
wherein

- 5 R^1 is selected from the group consisting of hydroxy, C_1 to C_6 alkyl, halogenated C_1 to C_6 alkyl and the group NR^7R^8 wherein R^7 and R^8 are independently selected from hydrogen and C_1 to C_4 alkyl;

- 10 the group NR_6OH wherein R^6 is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, carbocyclic and substituted carbocyclic; and

the group NR^7R^8 wherein R^7 and R^8 are independently selected from hydrogen and C_1 to C_4 alkyl;

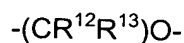
- 15 R^2 is selected from the group consisting of hydrogen C_1 to C_8 alkyl, halo $-(C_1$ to $C_6)$ alkyl and C_1 to C_6 alkyl substituted by the group of formula



wherein R^{14} and R^{15} are independently selected from the group consisting of hydrogen and C_1 to C_4 alkyl; and

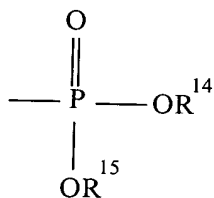
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and the group wherein R^2 is linked to R^1 to provide the group $-R^1-R^2-$ of formula



- 25 where R^{12} and R^{13} are independently selected from hydrogen, C_1 to C_4 alkyl and C_1 to C_4 haloalkyl;

R^3 is selected from the group consisting of hydrogen, C_1 to C_6 alkyl, C_1 to C_6 alkanoyl, C_1 to C_6 haloalkyl and C_1 to C_6 alkyl and C_1 to C_6 alkyl substituted by the group of formula

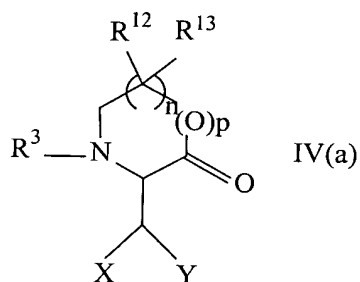


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wherein R^{14} and R^{15} are independently selected from the group consisting of hydrogen and C_1 to C_4 alkyl;

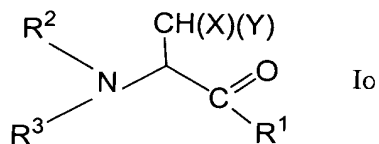
10 X and Y are independently selected from the group consisting of hydrogen, C_1 to C_4 alkyl thiol, aryl, hydroxyaryl, acyl, aryl substituted C_1 to C_4 alkyl, heterocyclic, thio- C_1 to C_4 alkyl, amino- C_1 to C_4 alkyl and hydroxyalkyl.

8. An insecticide according to claim 2 wherein the compound is of formula IV(a):

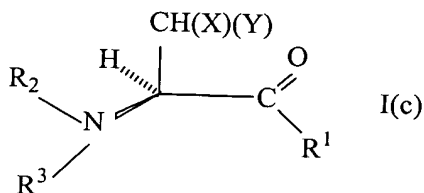


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9. An insecticide according to claim 2 wherein p and q are zero to provide a formula Ia



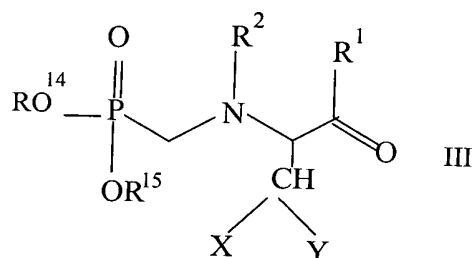
20 and wherein at least 60 mole percent of said compound has the stereochemistry of formula I(c):



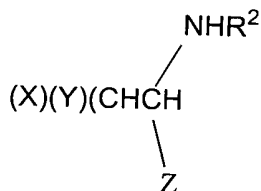
10. An insecticide according to claim 9 wherein at least 80% of the compound of formula Ia has the stereochemistry 1(c).
- 5 11. An insecticide according to claim 9 wherein at least 90% of the compound of formula Ia has the stereochemistry 1(c).
12. An insecticide according to claim 2 wherein the insecticide is derived from an amino acid comprising at least 80% of the L-enantiomer.
- 10 13. An insecticide selected from the group consisting of 3-Methyl-2-(phosphonomethyl-amino)-butyric acid; [(1-Hydroxycarbamoyl-3-methyl-butylamino)-methyl]-phosphonic acid monomethyl ester; [(1-Hydroxycarbamoyl-2-phenyl-ethylamino)-methyl]-phosphonic acid monomethyl ester; 2-Methylamino-propionic acid; -Phenyl-2-(phosphonomethyl-amino)-propionic acid; N-Hydroxy-2-methylamino-propionamide; [(1-Hydroxycarbamoyl-ethylamino)-methyl]-phosphonic acid monomethyl ester; 4-(2-methylpropyl)-3-(dimethoxy-phosphonomethyl)-2,2-bis-trifluoromethyl-oxazolidin-5-one; 2-Acetyl-amino-N-hydroxy-3-phenyl-propionamide; 2-[(Dimethoxy-phosphorylmethyl)-amino]-3-hydroxy-butyric acid methyl ester; 4-Benzyl-3-bromomethyl-2,2-bis-trifluoromethyl-oxazolidin-5-one; 2-[Bis-(dimethoxy-phosphorylmethyl)-amino]-3-methyl-butyric acid methyl ester; 4-Benzyl-3-methyl-2,2-bis-trifluoromethyl-oxazolidin-5-one; [(1-Hydroxycarbamoyl-2-methyl-propylamino)-methyl]-phosphonic acid; 3-Methyl-2-methylamino-pentanoic acid; [(1-Hydroxycarbamoyl-3-methyl-butylamino)-methyl]-phosphonic acid; and 2-Amino-1-(2-benzyloxymethyl-pyrrolidin-1-yl)-3-methyl-butan-1-one; and the salts thereof.
- 15 14. The insecticide compound N-phosphonomethyl valine.
- 20 15. An insecticide comprising N-phosphonomethyl valine wherein at least 80% of N-phosphonomethyl valine is the D(+) enantiomer.
- 25 30

16. An insecticide according to claim 2 further comprising a chelating agent for divalent metals.
- 5 17. An insecticide according to claim 16 wherein the chelating agent is selected from the group consisting of polycarboxylic acid chelating agents, aromatic and aliphatic carboxylic acid chelating agents, amino acid chelating agents, ether polycarboxylic acid chelating agents, phosphonic acid chelating agents, hydroxycarboxylic acid chelating agents and dimethylglyoxime. The
10 chelating agents may be in the form of the acid or salt particularly the sodium, potassium or ammonium salt.
18. An insecticide according to claim 2 further comprising a further insecticidal compound selected from the group consisting of
15 organophosphorus compounds, pyrethroids, carbamates, biopesticides, endosulfan, abemectin, XDE-105, diafenthiuron, fipronil, chlorfenapyr, tebufenocides, fenazaquin, imidaclopride, triazamates, fentin amitraz, MK-242 and 4-haloalkyl-3-heterocyclylpyridines and 4-haloalkyl-5-heteroxyclylpyremides and their salts.
- 20 19. An insecticide according to claim 18 wherein the composition comprises an insecticide selected from the group consisting of spinosad, endosulfan and amitraz.
- 25 20. An insecticide according to claim 18 wherein the weight ratio of the compound of formula 1 and said further insecticidal compounds is from 95:5 to 9:95.
- 30 21. An insecticide according to any one of claims 1 to 20 wherein the insecticide comprises from 1 to 99% by weight of the compound of formula I and an agriculturally acceptable carrier therefor.
22. An insecticide according to claim 21 wherein the insecticide includes an agriculturally acceptable carrier and a surface active agent.

23. An method of controlling insects comprising applying to the locus of the insects an insecticide according to any one of the previous claims.
- 5 24. A method of controlling insects in crops comprising applying to the crop an effective amount of an insecticide according to any one of claims 1 to 20.
25. A method according to claim 23 wherein the insecticide is used to
10 control insect species selected from the orders Hepidoptera, Hemiptera, Orthoptera, Coleopteran, Psocoptera, Isoptera, Physaloptera and Homoptera.
26. A method according to claim 24 wherein the crop is cotton.
- 15 27. A method for the preparation of an insecticide of formula III



comprising reacting an amino acid or derivative thereof of formula (V)



20

wherein Z is -CN or COOR⁵

wherein R⁵ is selected from the group consisting of alkyl, substituted alkyl, aryl, substituted aryl, cycloalkyl, substituted cycloalkyl, heterocyclic and substituted heterocyclic;

with a compound for formula

$$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}^{12}\text{C} \quad \text{R}^{13} \end{array}$$

wherein R^{12} and R^{13} are independently selected from hydrogen, halogen, alkyl and haloalkyl;

5

reacting the intermediate with a phosphite of formula $\text{HPO}(\text{OR}^{14})(\text{OR}^{15})$ wherein R^{14} and R^{15} are independently selected from the group consisting of alkyl, to provide the compound of formula III and optionally hydrolysing the ester groups to provide a compound of formula III wherein R^{14} and R^{15} are hydrogen and R^1 is hydroxy.

10